

- Reliable operation
- Low LCC
- Easy handling

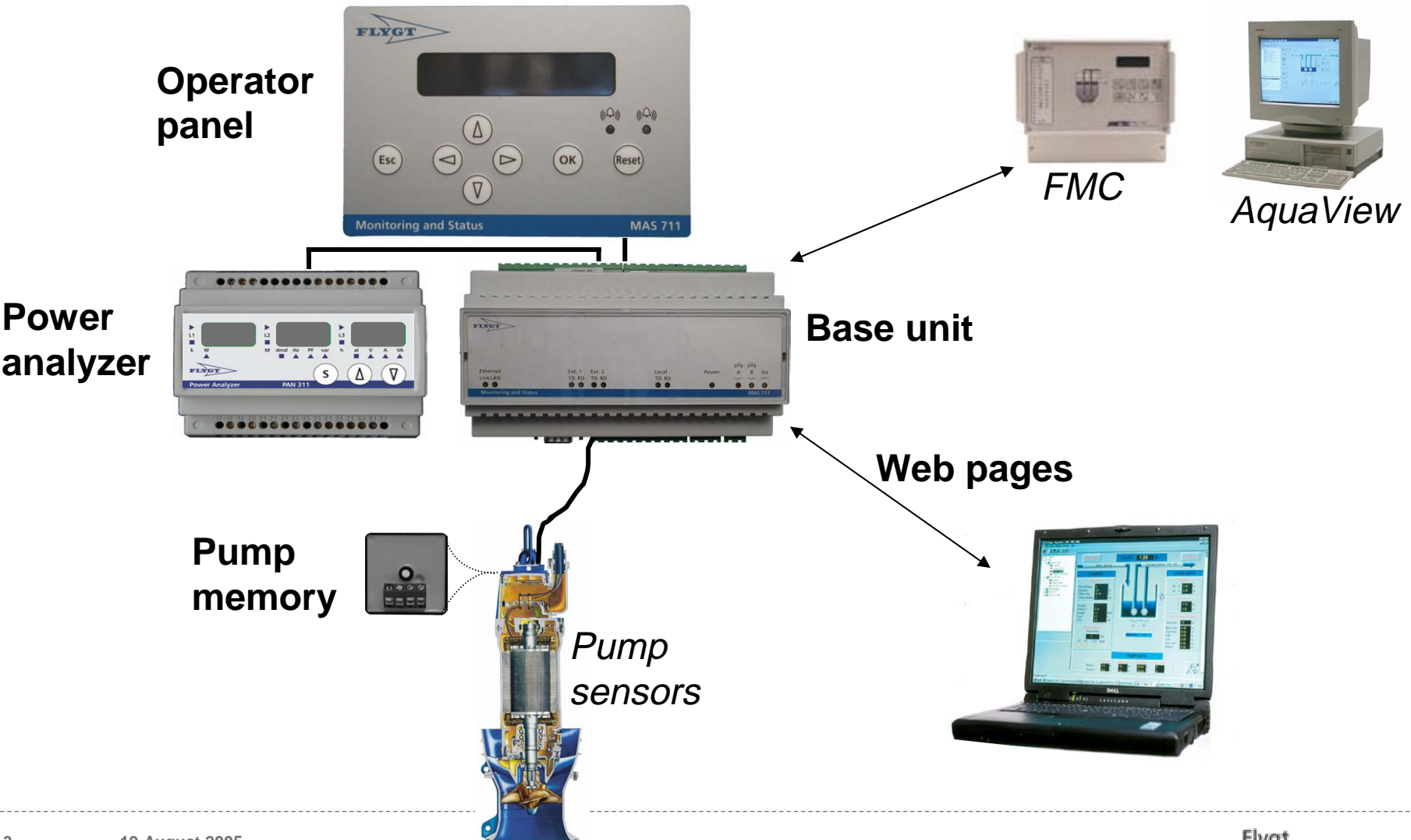


Protection of one pump

- Stop of pump (A-alarm)
- Early warning (B-alarm)

Status and communication

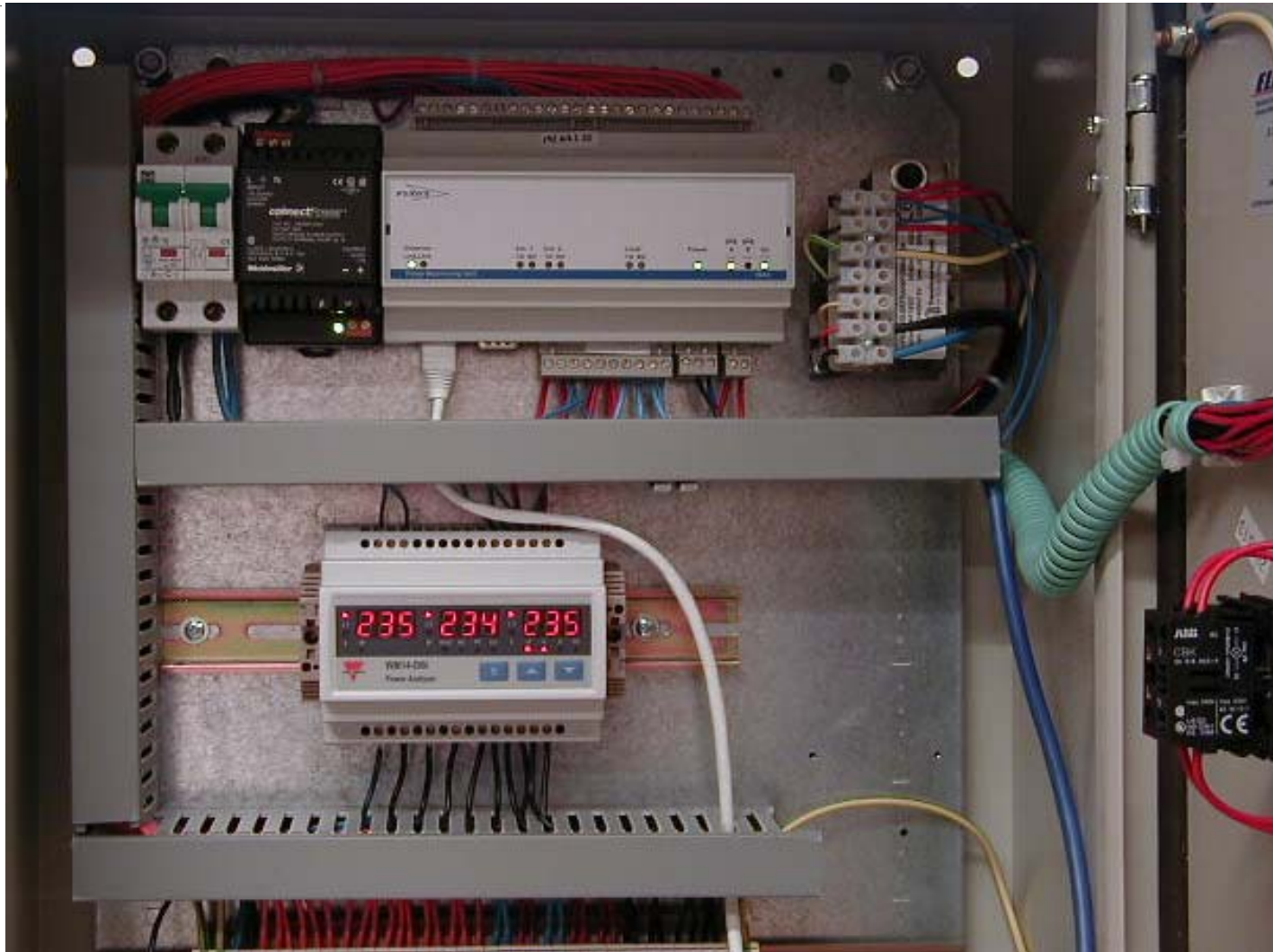
- Data & alarm recording
- Web tool for viewing, fault analysis and setup
- Integral part of Flygt's pump control and SCADA system (or other systems on the market)
- Input for smart pump control
- Feedback to R&D



Door mounted Operator panel



DIN-rail mounted Base unit and Power analyzer

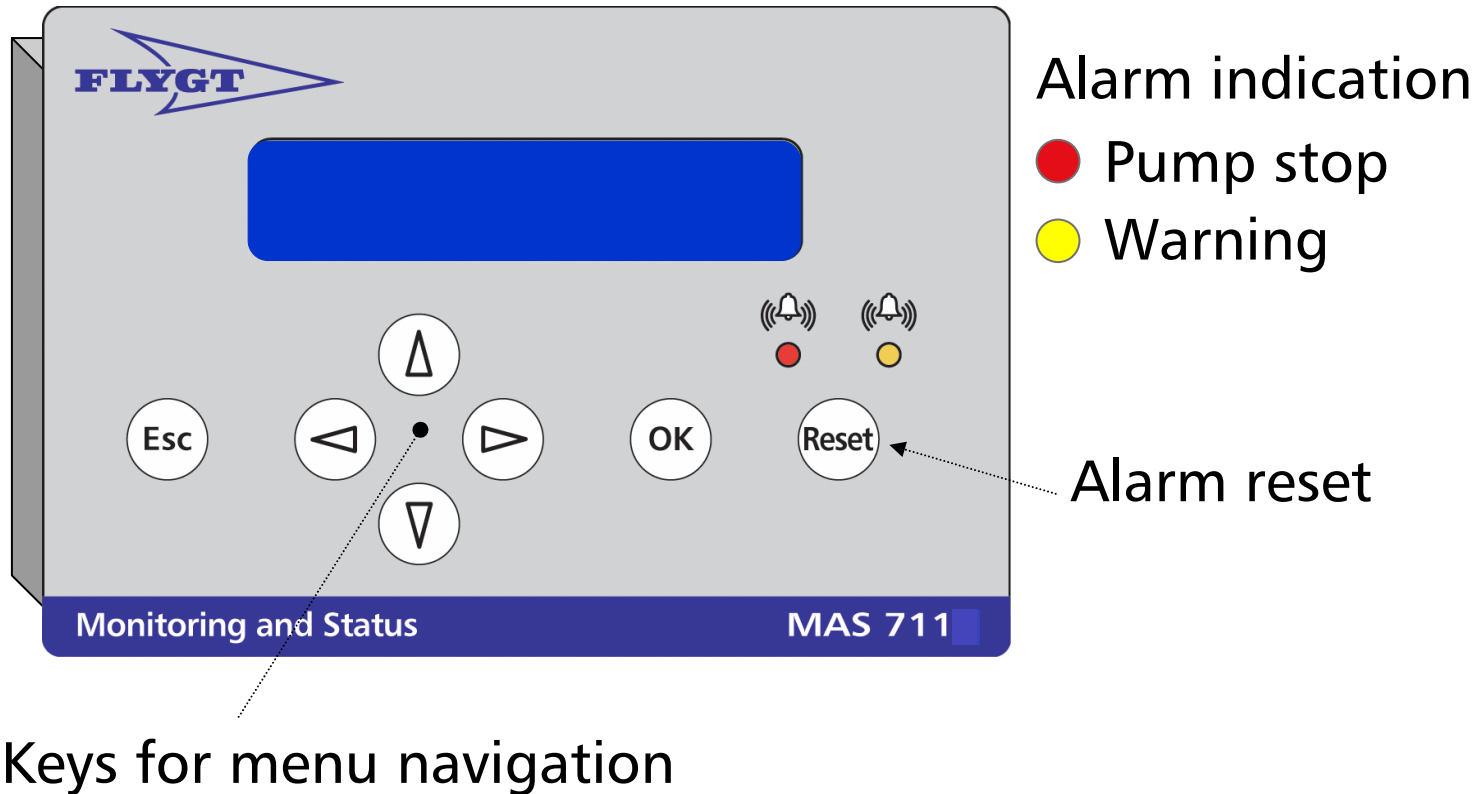




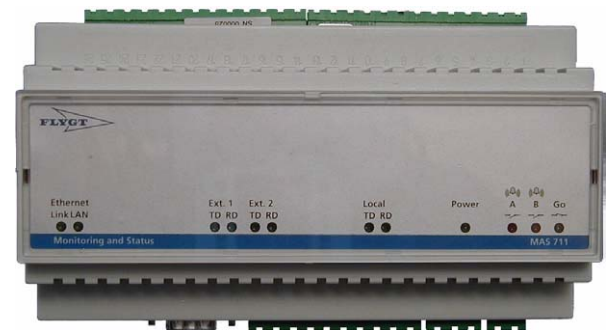
- Connection of sensors
- Memory for logging
- Embedded web pages
- Alarm relays and LED:s
- Pump interlock relay
- Serial comm. ports
- LED:s indicate comm.
- ...

Operator panel (with new design)

Display for alarm indication, setup etc.



- Embedded web pages in Base unit
- Access with PC and web browser
 - Locally with a laptop
 - LAN
 - Internet
 - Modem



MAS web-tool - Microsoft Internet Explorer provided by ITT Flygt AB Emmaboda

File Edit View Favorites Tools Help

Address http://10.78.22.14/mas.htm Go

Lab-MAS 1
Gesällvägen 33
Serial number : 3356.665-0361058

Alarm status **A** **B**

ITT Industries
Engineered for life

MAS web-tool

View **Setup**

Quick Overview
Trend diagrams
Running statistics
Active alarms
Alarm and event log
Temp stator ph 1-3
Temp stator ph 1
Temp stator ph 2
Temp stator ph 3
Temp main bearing
Temp support bearing
Temp pump memory
Leak. stator housing
Leak. junction box
Leak. water in oil
Vibration
Pump current
Current unbalance
Voltage unbalance
System power
System power factor
4-20 mA Vibration
Digital I/O ports
Pump info
Data log
General configuration

Alarm and Event log 2005-06-20 20:40:34

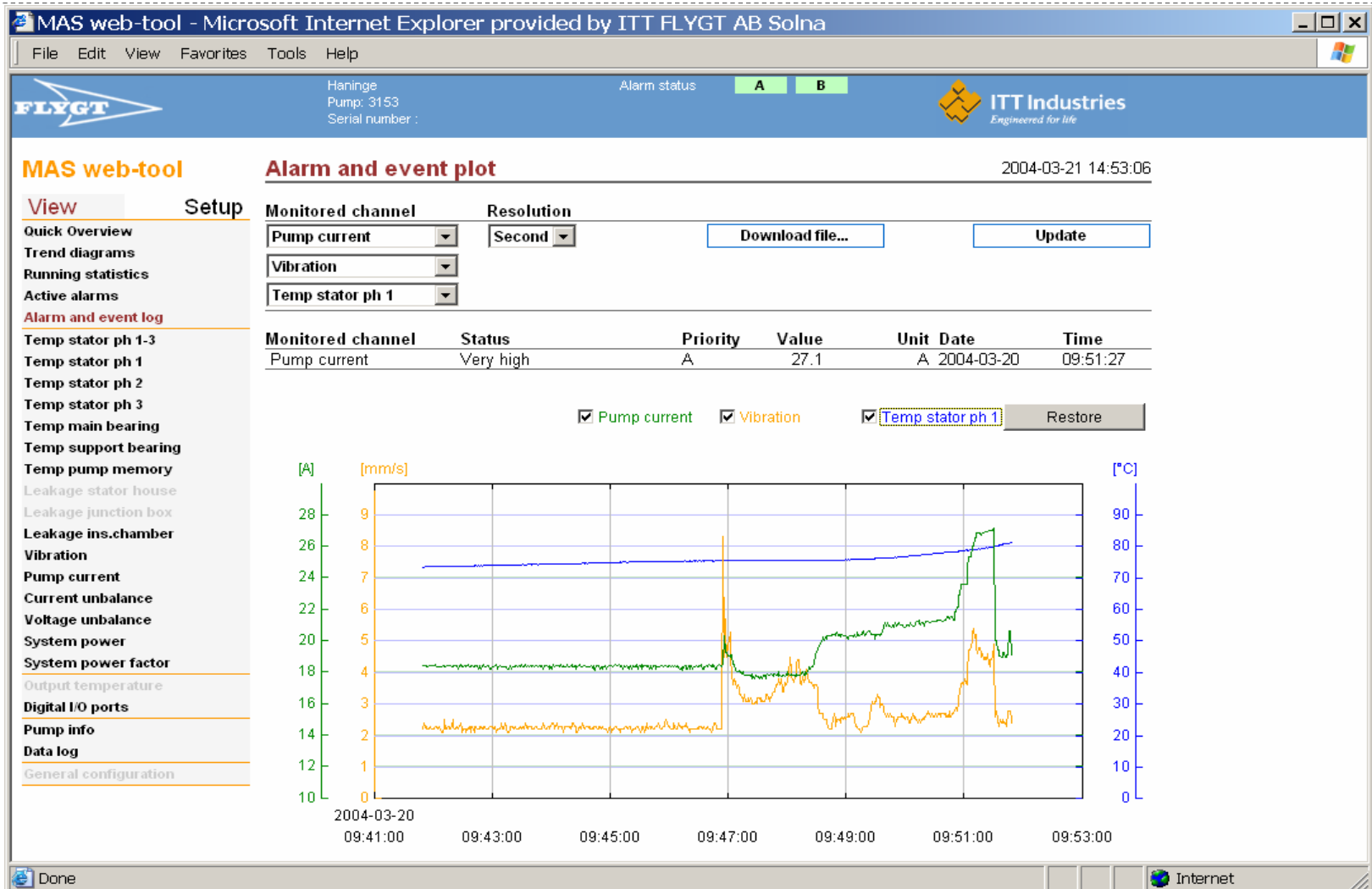
Acknowledge **Download file** **Update**

Click a light blue alarm item below to view logged data 9 minutes prior to alarm and 1 minute after.

Monitored channel	Status	Priority	Value	Unit	Date	Time
Temp stator ph 1	High	B	54.0	°C	2005-06-20	19:06:00
Temp stator ph 1	Very high	A	55.0	°C	2005-06-20	18:56:35
Temp stator ph 1	High	B	32.0	°C	2005-06-20	18:17:02
Temp stator ph 1	OK		31.0	°C	2005-06-20	18:13:07
Temp stator ph 1	High	B	54.0	°C	2005-06-20	16:08:40
Temp stator ph 1	Very high	A	55.0	°C	2005-06-20	15:57:45
Temp stator ph 1	High	B	54.0	°C	2005-06-20	14:32:32
Temp stator ph 1	Very high	A	55.0	°C	2005-06-20	14:22:22
Temp stator ph 1	High	B	32.0	°C	2005-06-20	13:41:49
Temp stator ph 1	OK		31.0	°C	2005-06-20	13:37:52
Temp stator ph 1	High	B	54.0	°C	2005-06-20	11:33:54
Temp stator ph 1	Very high	A	55.0	°C	2005-06-20	11:23:24
Temp stator ph 1	High	B	32.0	°C	2005-06-20	10:42:12
Temp stator ph 1	OK		31.0	°C	2005-06-20	10:38:25
Temp stator ph 1	High	B	54.0	°C	2005-06-20	08:38:04
Temp stator ph 1	Very high	A	55.1	°C	2005-06-20	08:27:46
Temp stator ph 1	High	B	32.0	°C	2005-06-20	07:46:23
Temp stator ph 1	OK		31.0	°C	2005-06-20	07:42:46
Temp stator ph 1	High	B	54.0	°C	2005-06-20	05:51:22
Temp stator ph 1	Very high	A	55.0	°C	2005-06-20	05:41:04
Temp stator ph 1	High	B	32.0	°C	2005-06-20	05:01:02
Temp stator ph 1	OK		31.0	°C	2005-06-20	04:56:54
Temp stator ph 1	High	B	54.0	°C	2005-06-20	02:57:44
Temp stator ph 1	Very high	A	55.0	°C	2005-06-20	02:46:33
Temp stator ph 1	High	B	32.0	°C	2005-06-20	02:10:27
Temp stator ph 1	OK		31.0	°C	2005-06-20	02:06:52
Temp stator ph 1	High	B	54.0	°C	2005-06-20	00:08:50

Done Internet

MAS feature: Alarm log plot (1s resol.)



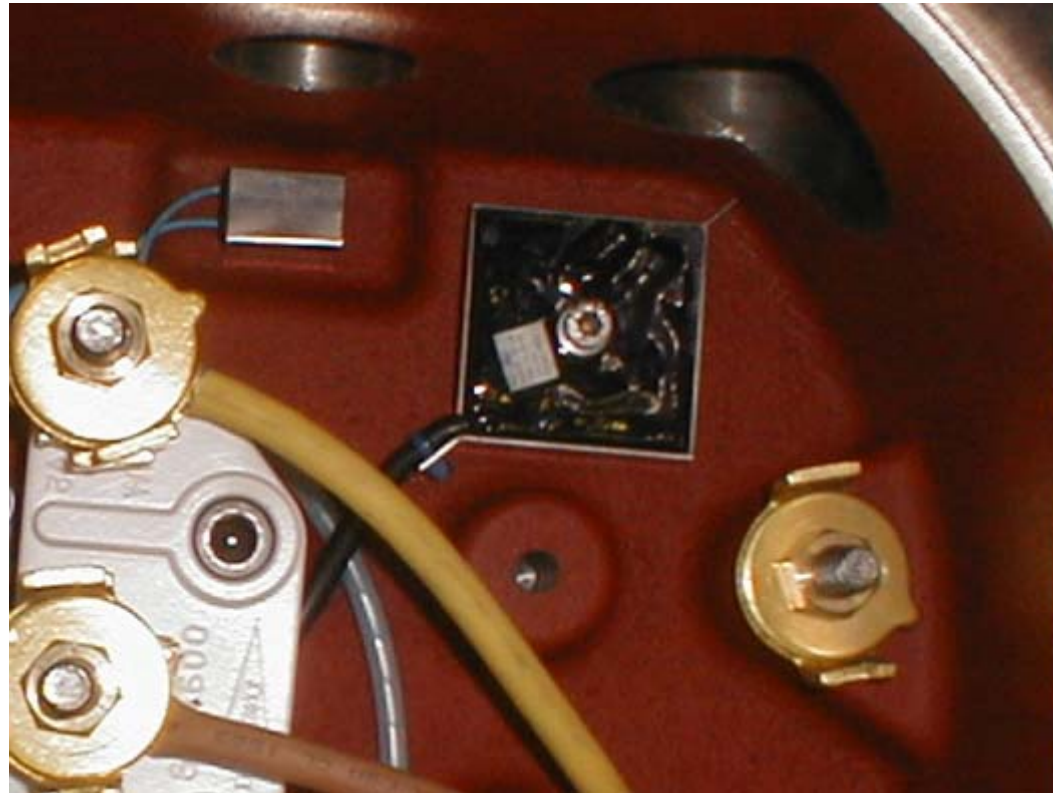
MAS feature: Alarm log plot (1 min. resol.)



VIS10 - New sensor introduced with MAS!

VIS10 used to warn:

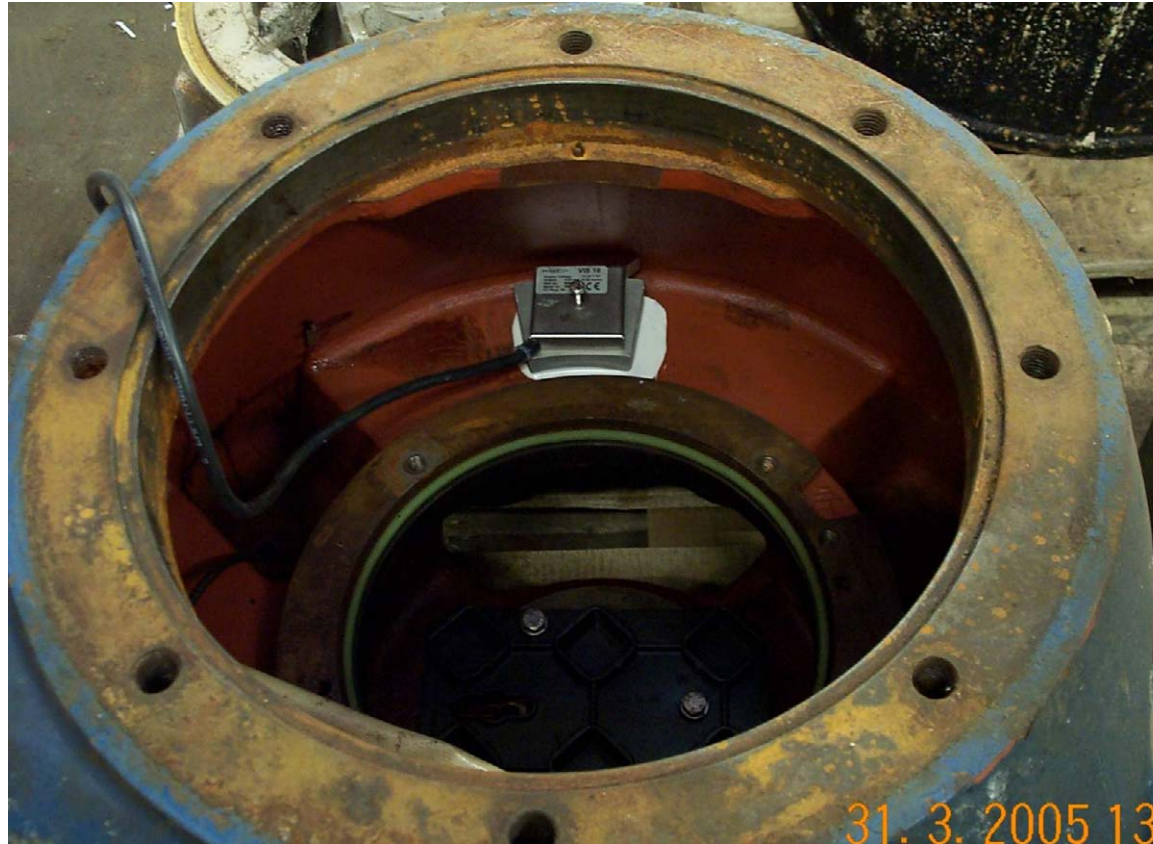
- at clogging
- at bad attachments
- at high level due to natural frequencies
- for loose and broken parts
- for defect bearings



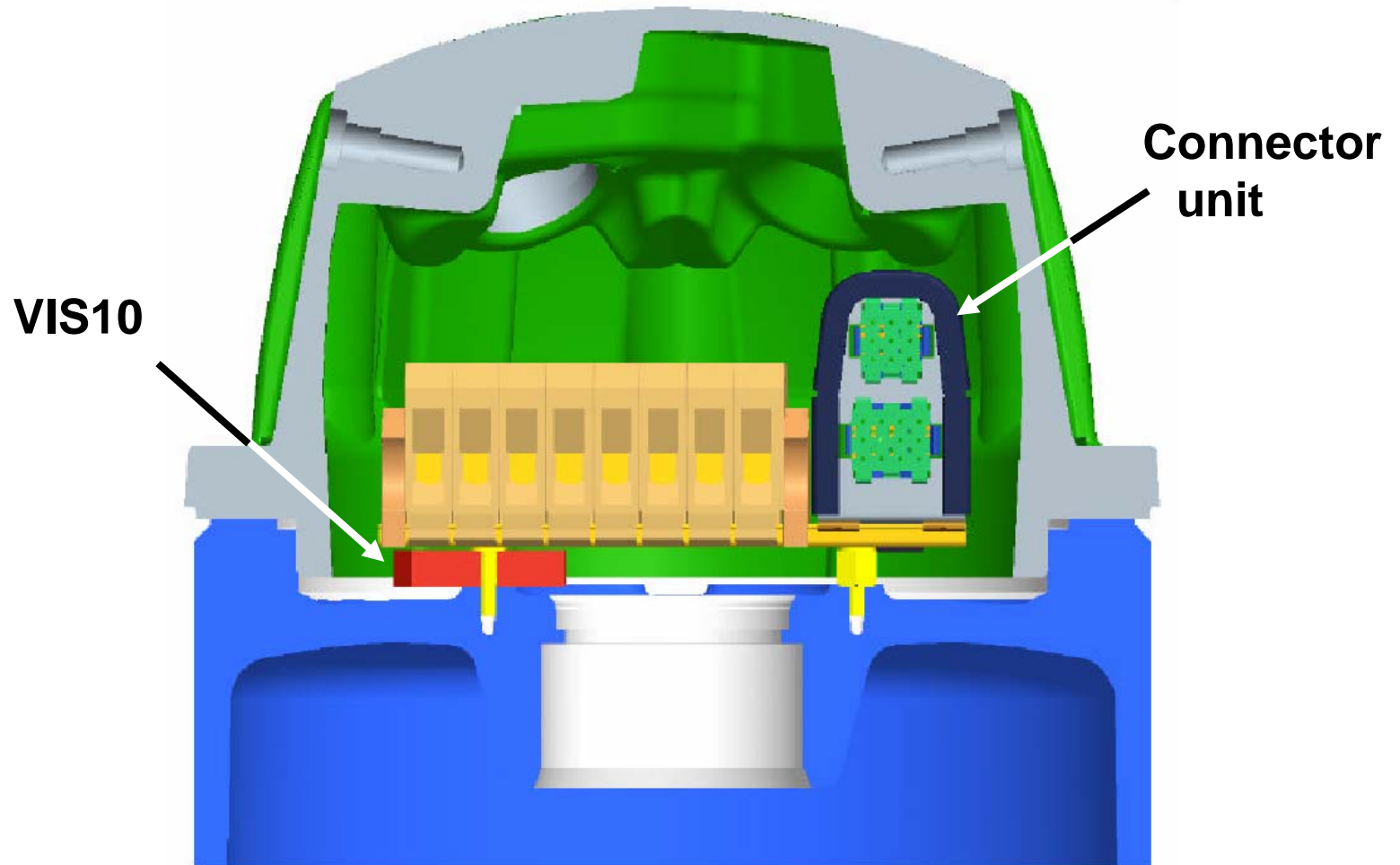
- Mounted in the pump top
- Measures in one direction

**Abbey Mills
pumping station
London**

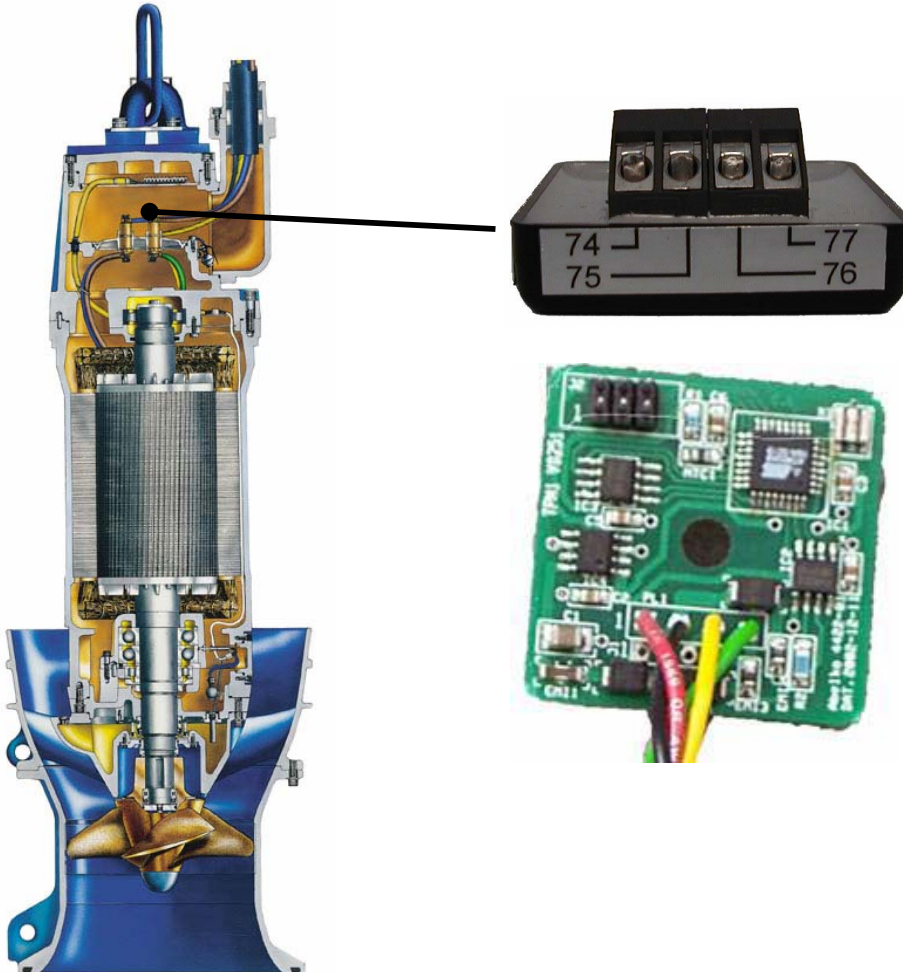
**16 * CP3800 retrofit
with MAS and VIS10**



VIS10 Vibration sensor in a 3202



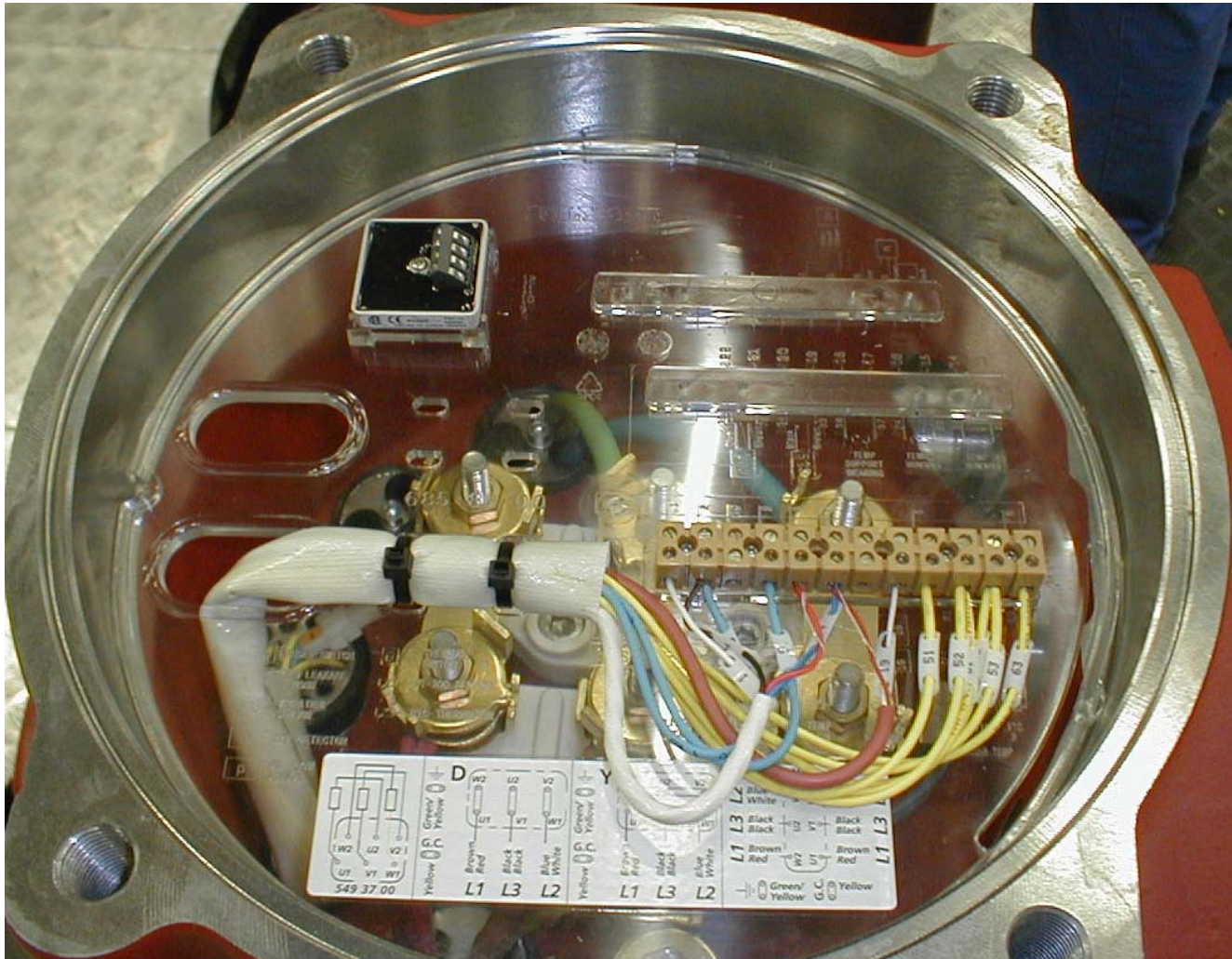
MAS feature: Pump memory



32 kByte (EEPROM)

- Data plate info
- Sensor configuration
- Starts&running time
- Service log
- Histograms
- Temp sensor on the board

Pump memory placement



Data plate information



Serial number	3306/705-0271042
Product number	3306/705-5049
Approvals	CE
Curve number	53-610
Voltage	400 V
Current	202 A
Delivery connection	D
Rated power, shaft	100 kW
Input power	109 kW
Cos phi	0,78
Weight	1520 kg
Ambient temp.	40 degC

The customer's selection of sensors are factory preloaded into the pump memory

This is uploaded at installation

MAS web-tool - Microsoft Internet Explorer provided by ITT FLYGT AB Solna

File Edit View Favorites Tools Help

FLYGT Lab demo pump Svetsarvägen 12 Serial number : 3358.665-0361058 Alarm status **A** **B** ITT Industries Engineered for life

2004-03-31 13:50

MAS web-tool

View **Setup**

Quick Overview
Trend diagrams
Running statistics
Active alarms
Alarm and event log

Temp stator ph 1-3
Temp stator ph 1
Temp stator ph 2
Temp stator ph 3
Temp main bearing
Temp support bearing
Temp pump memory
Leakage stator house
Leakage junction box
Leakage ins.chamber
Vibration
Pump current
Current unbalance
Voltage unbalance
System power
System power factor
Output at terminal
Digital I/O ports
Pump info
Data log
General configuration

Temp stator ph 2

Resistance measurement

Sensor: **PT100, analog** **Update**

Alarm setting

Status	Limits	Action priority	Reset option	Delay (0-30 s)
Broken circuit	> 250 ohm	B = Warning	Automatic	0
Very high	> 110 °C	A = Pump stop	Automatic	1
High	> 100 °C	B = Warning	Automatic	1
OK				
Short circuit	< 60 ohm	B = Warning	Automatic	0

Graph settings

Y-axis max value: **80** °C
Y-axis min value: **0** °C

Compensation for long leads: R = **0** ohm
R = $r_0 \cdot l / A$ where
 r_0 is the resistivity (copper: 0.0172 [ohm mm²/m])
 l is the length of the lead both ways [m]
 A is the wire cross section [mm²]

Upload of sensor settings from pump memory


MAS web-tool - Microsoft Internet Explorer provided by ITT FLYGT AB Solna

File Edit View Favorites Tools Help

Address <http://10.78.22.13/mas.htm> Go

Lab demo pump
Gesällvägen 33
Serial number : 3231-665-00-9781094

Alarm status **A** **B**

 **ITT Industries**
Engineered for life

MAS web-tool 2004-07-02 12:59:46

View **Setup**

Quick Overview
Trend diagrams
Running statistics
Active alarms
Alarm and event log

Temp stator ph 1-3
Temp stator ph 1
Temp stator ph 2
Temp stator ph 3
Temp main bearing
Temp support bearing
Temp pump memory
Leakage stator house
Leakage junction box
Leakage ins.chamber
Vibration
Pump current
Current unbalance
Voltage unbalance
System power
System power factor
Output at terminal
Digital I/O ports
Pump info
Data log
General configuration

Pump info

| Data plate | Service log | Service interval | **Pump memory** | **Update**

Automatic pump memory synchronization

The following data is automatically copied from MAS to the non-volatile pump memory every 2:nd hour.

- Pump data plate information
- Alarm settings
- Start and stop registrations
- Histograms
- Service log

Pump memory synchronization

Copy all from pump memory to MAS	Copy
Copy all from MAS to pump memory	Copy

- 'Copy all from pump memory to MAS' is performed to upload name plate data and the currently installed sensors (and associated parameters)



Start and running time registrations

FileEditViewFavoritesToolsHelp

Addresshttp://10.78.22.14/mas.htmGo

Lab-MAS 1
Gesällvägen 33
Serial number : 3356.665-0361058

Alarm status
A**B**

ITT Industries
Engineered for life

MAS web-tool

ViewSetup

Quick Overview
Trend diagrams
Running statistics
Active alarms
Alarm and event log
Temp stator ph 1-3
Temp stator ph 1
Temp stator ph 2
Temp stator ph 3
Temp main bearing
Temp support bearing
Temp pump memory
Leakage stator house
Leakage junction box
Leakage ins.chamber
Vibration
Pump current

Running statistics

2004-10-18 14:26:30

| Histogram| Counters| Start & stop registrations


Save

Number of pump starts	Pump running time (hours)	Log time
70	78.3	-
303	258.0	2004-10-04 11:02:59
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-
0	0.0	-

MAS web-tool - Microsoft Internet Explorer provided by ITT FLYGT AB Solna

File Edit View Favorites Tools Help


Address http://10.78.22.13/mas.htm Go



Lab demo pump
Gesällvägen 33
Serial number : 3231-665-00-9781094

Alarm status

A B


ITT Industries
Engineered for life

MAS web-tool

View

Setup

Quick Overview

Trend diagrams

Running statistics

Active alarms

Alarm and event log

Temp stator ph 1-3

Temp stator ph 1

Temp stator ph 2

Temp stator ph 3

Temp main bearing

Temp support bearing

Temp pump memory

Leakage stator house

Leakage junction box

Leakage ins.chamber

Vibration

Pump current

Current unbalance

Voltage unbalance

System power

System power factor

Output at terminal

Digital I/O ports

Pump info

Data log

General configuration

Pump info

2004-07-02 12:59:46

Data plate

Service log

Service interval

Pump memory

Update

Data plate

Custom

Serial number : 3356.665-0361058
Product number : 3356.665-5094
Approvals : CE
Curve number : 53-610
Voltage : 400 V
Current : 150 A
Delivery connection : D
Rated power, shaft : 75 kW
Input power : 82 kW
Cos phi : 0,79
Weight : 1150 kg
Ambient temperature : 40 degC

2004-03-30 Change of impeller to 252


- Fix text

- Editable text field
 - 20 lines (max)

21

19 August 2005

Flygt




MAS web-tool - Microsoft Internet Explorer provided by ITT FLYGT AB Solna

File Edit View Favorites Tools Help

Address <http://10.78.22.13/mas.htm> Go

Lab demo pump
Gesällvägen 33
Serial number : 3231-665-00-9781094

Alarm status **A** **B**

 **ITT Industries**
Engineered for life

MAS web-tool **Pump info** 2004-07-02 12:59:46

View **Setup**

Quick Overview
Trend diagrams
Running statistics
Active alarms
Alarm and event log
Temp stator ph 1-3
Temp stator ph 1
Temp stator ph 2
Temp stator ph 3
Temp main bearing
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Leakage junction box
Leakage ins.chamber
Vibration
Pump current
Current unbalance
Voltage unbalance
System power
System power factor
Output at terminal
Digital I/O ports
Pump info
Data log
General configuration

| Data plate | **Service log** | Service interval | Pump memory | [Update](#)

Service log edit field

030810 Removal of clogging items from impeller
031019 Change of seals and oil

Lines that do not fit in the edit field are too long to be saved and the extra tokens will be lost. The service log is saved when the "File saved!" alert box is shown.

• Editable field

- 200 lines of text stored in pump memory

[Download file...](#)

MAS web-tool - Microsoft Internet Explorer provided by ITT FLYGT AB Solna

File Edit View Favorites Tools Help

Address <http://10.78.22.13/mas.htm> Go

Lab demo pump
Gesällvägen 33
Serial number : 3231-665-00-9781094

Alarm status **A** **B**

ITT Industries
Engineered for life

MAS web-tool

View **Setup**

Quick Overview
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Leakage junction box
Leakage ins.chamber
Vibration
Pump current
Current unbalance
Voltage unbalance
System power
System power factor
Output at terminal
Digital I/O ports
Pump info
Data log
General configuration

Pump info 2004-07-02 12:59:46

| Data plate | Service log | **Service interval** | Pump memory | **Update**

Service interval	Current reading	Next service message at	Service message every	
Number of starts	3419	<input type="text" value="3517"/>	<input type="text" value="200"/> start	<input checked="" type="checkbox"/>
Pump running time (hour)	1731.5	<input type="text" value="2119.0"/>	<input type="text" value="500"/> hour	<input checked="" type="checkbox"/>
At date (YYYY-MM-DD hh:mm:ss)		<input type="text" value="2004-09-01 08:00:00"/>		<input checked="" type="checkbox"/>

- Service will be requested in the form of a B-alarm if any of the conditions are fulfilled

Running statistics

2004-03-31 13:53:27

| Histogram

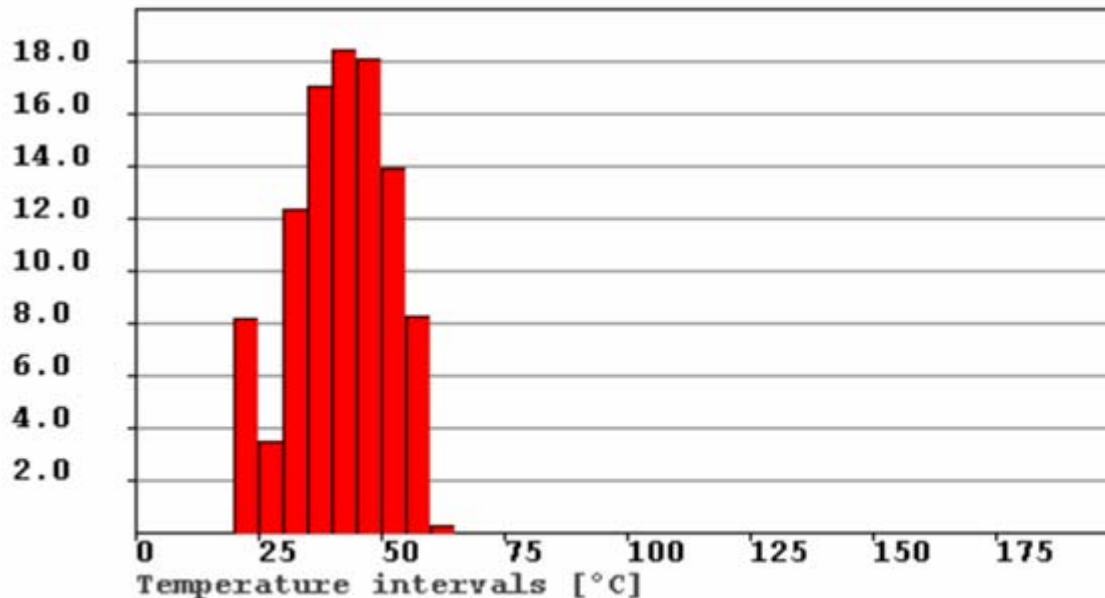
| Counters

| Start & stop registrations

Histogram:

[Update](#)

Percent of time [%]



Mean temperature:
42 °C
Time:
713 hours

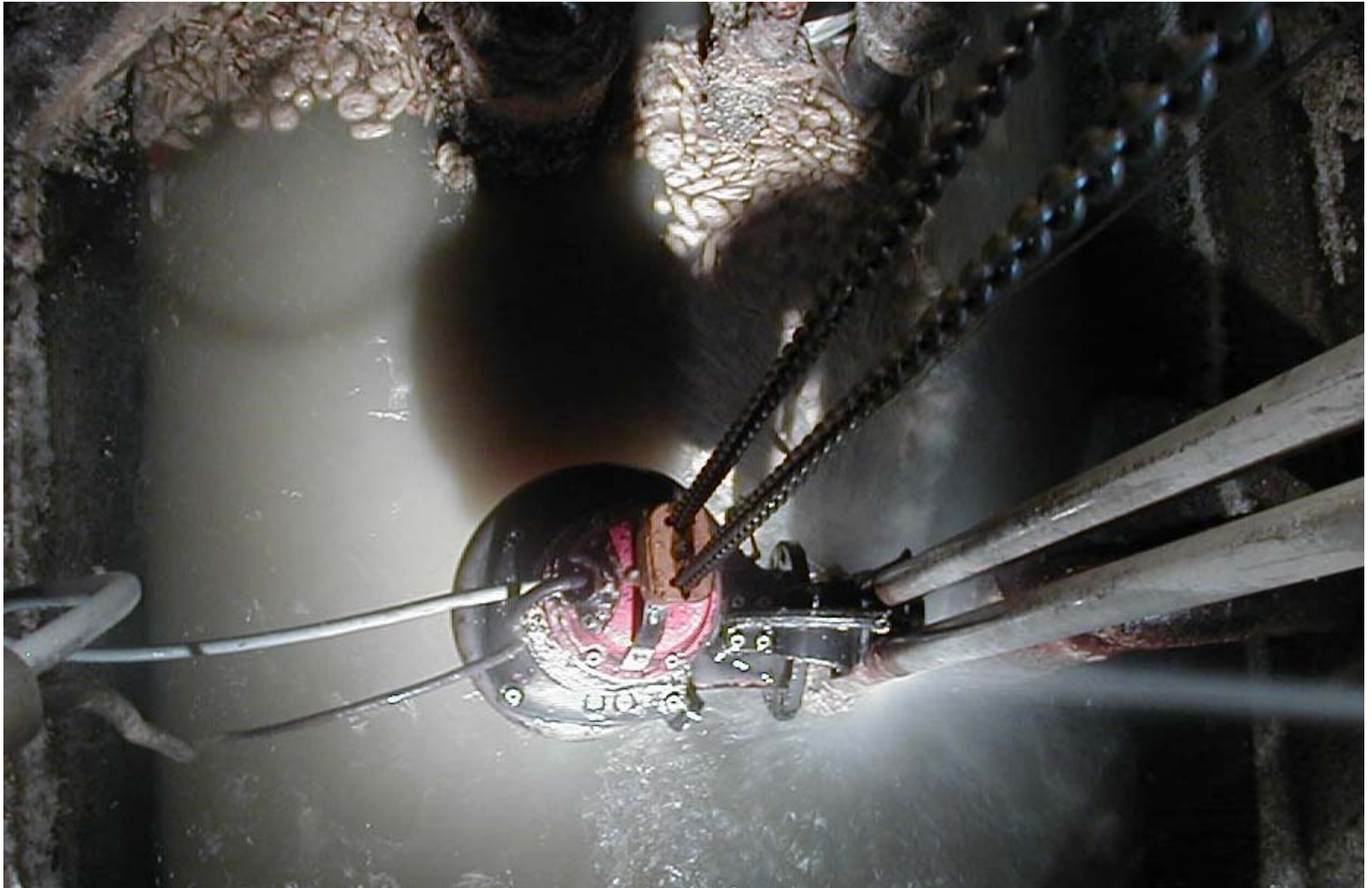
Alarm on CAS (present monitoring relay)

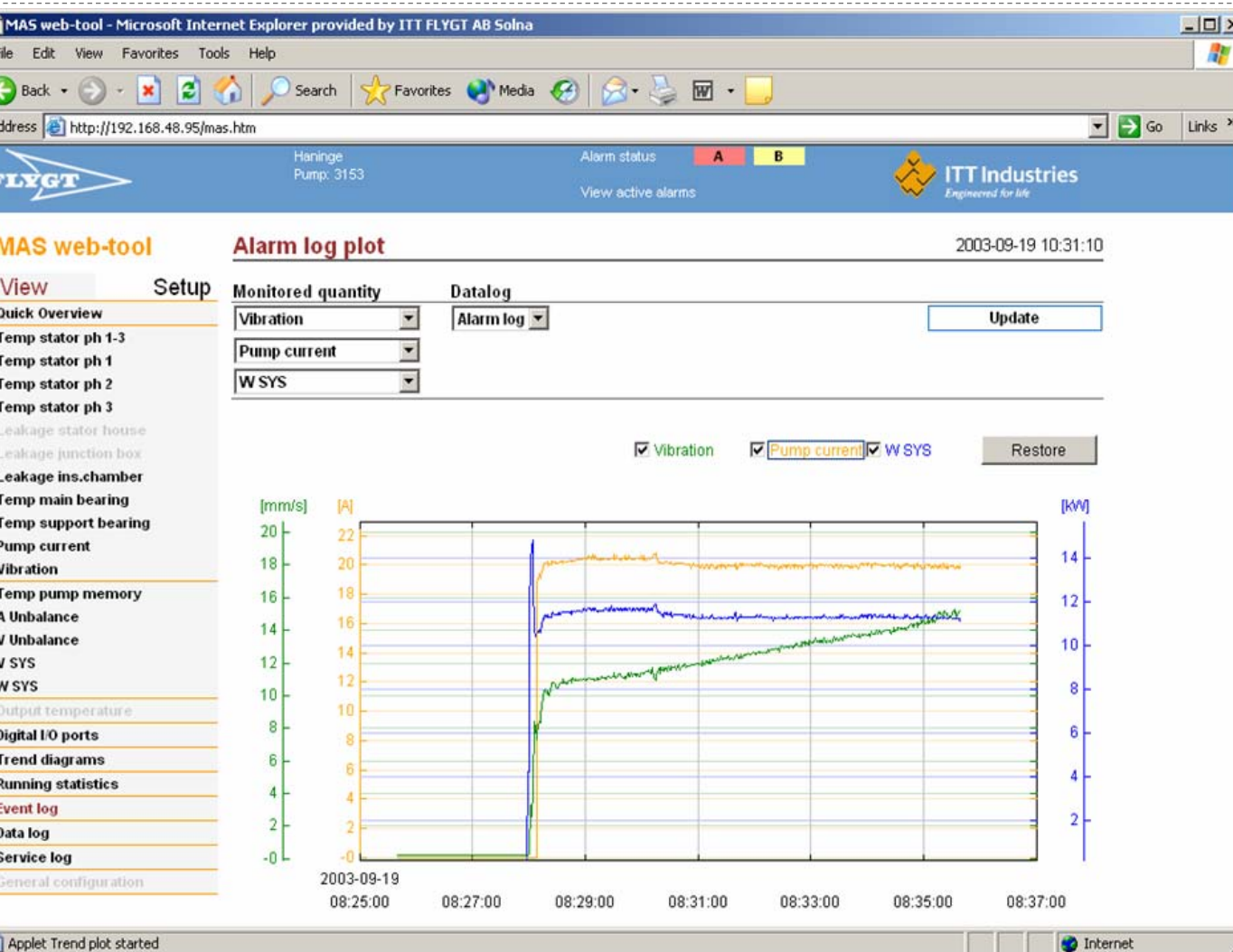


High temp alarm

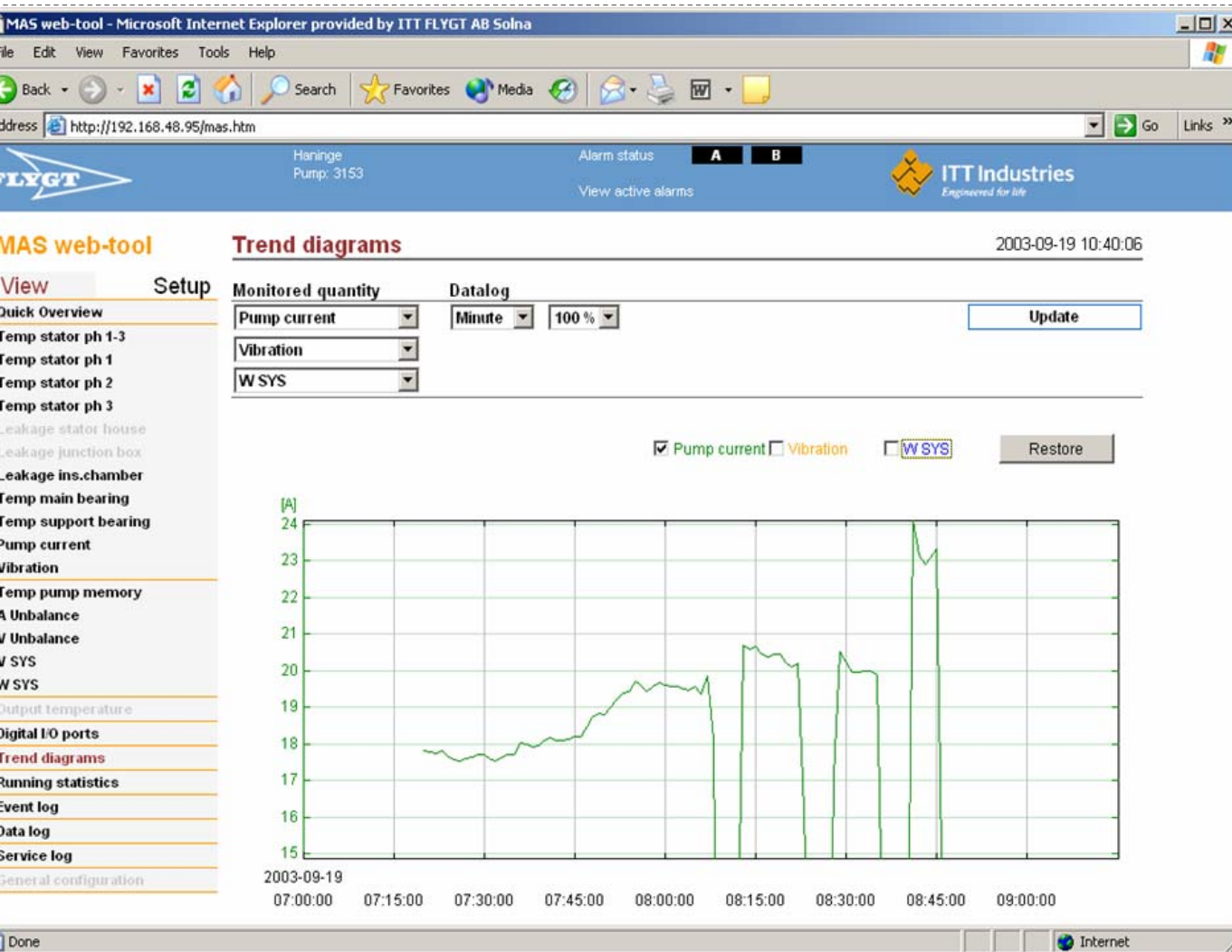
- What is the cause?
- High current?
- Clogging?
- Reset and run again

Real case: MAS and pump on field trial



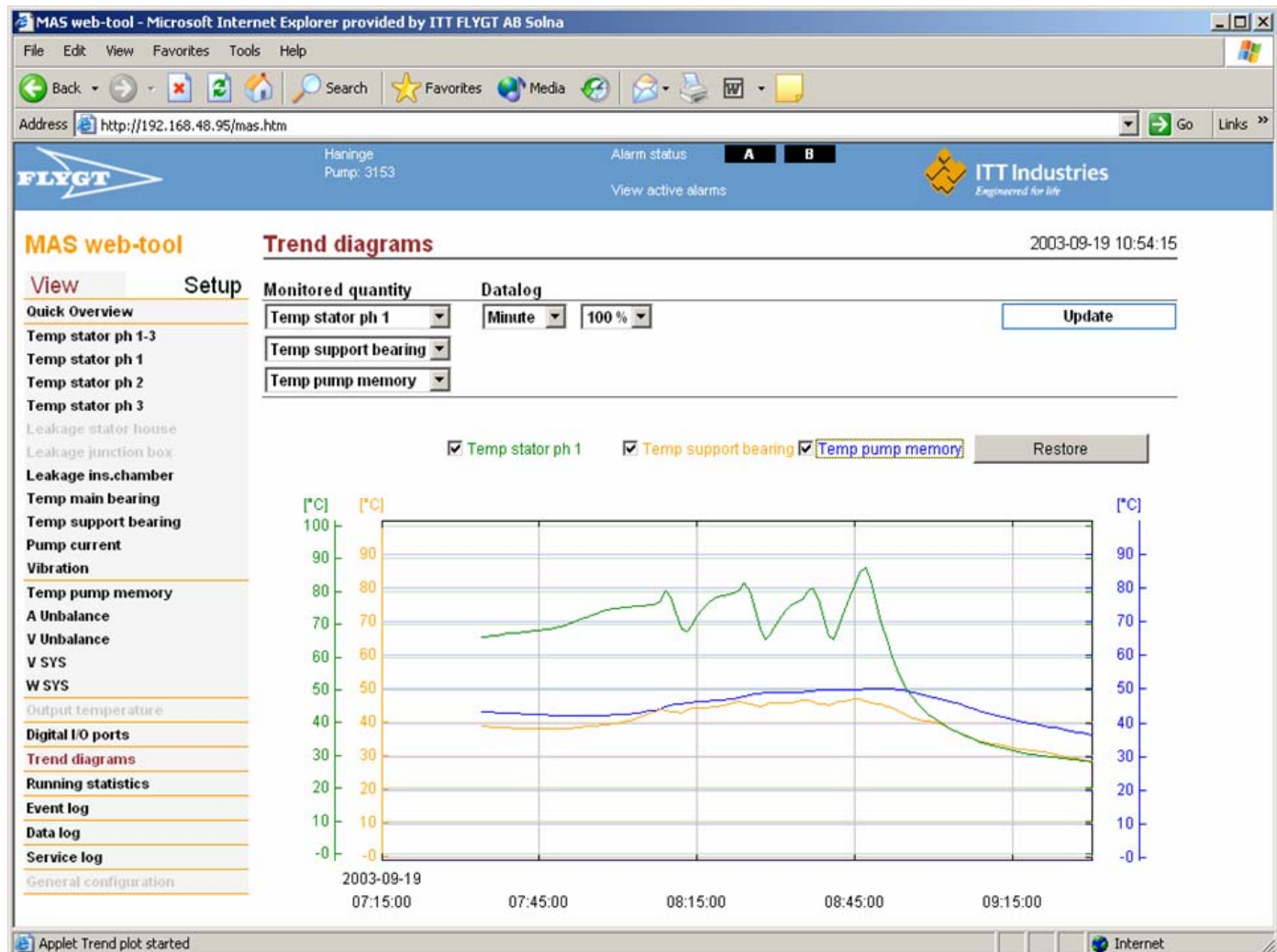


- Alarm log plot
- Black box function
- 10 minutes of data
- Vibration: 14 mm/s



- 2 hours of data
- Increasing trend!

Temperatures also rise

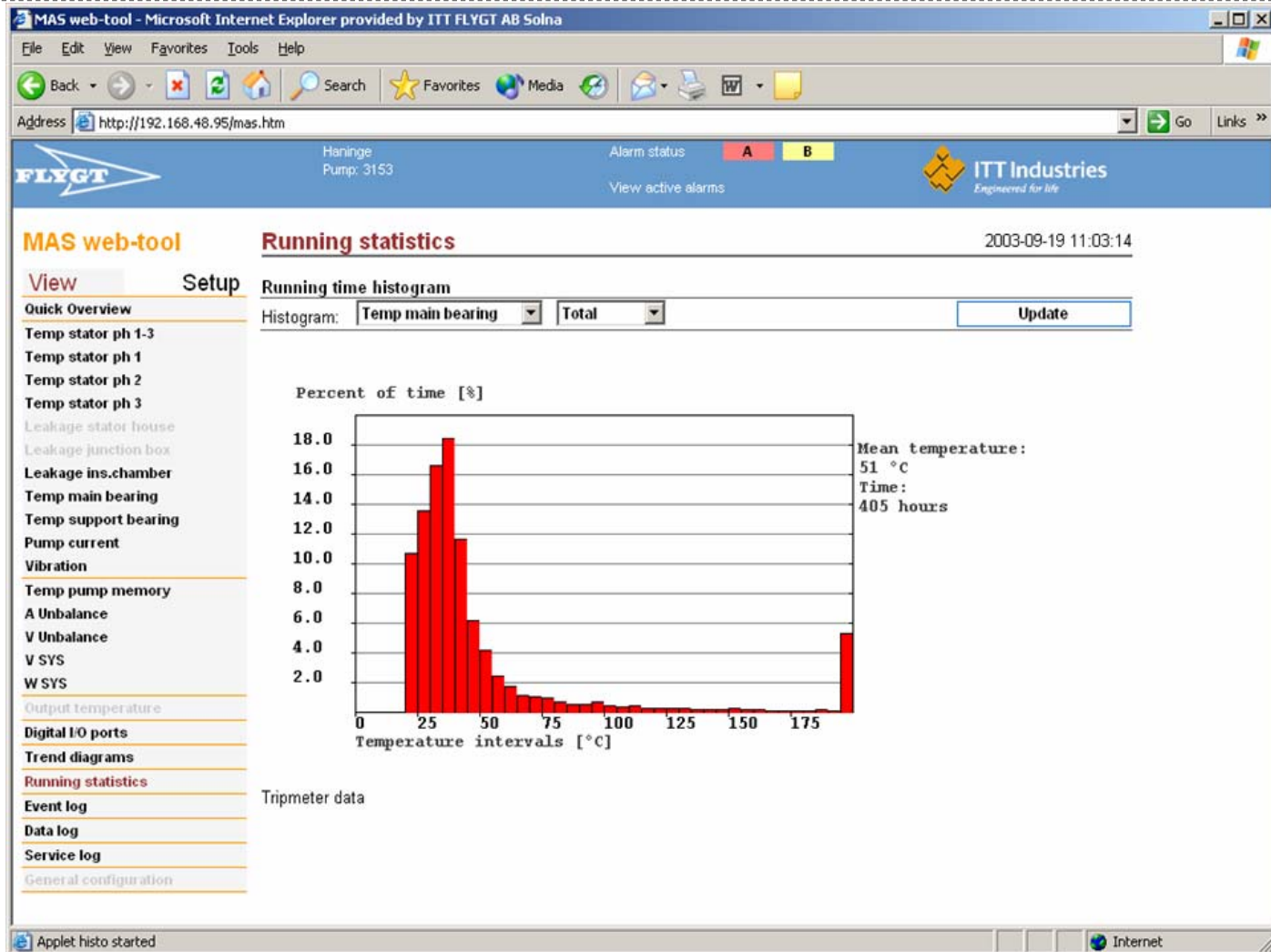


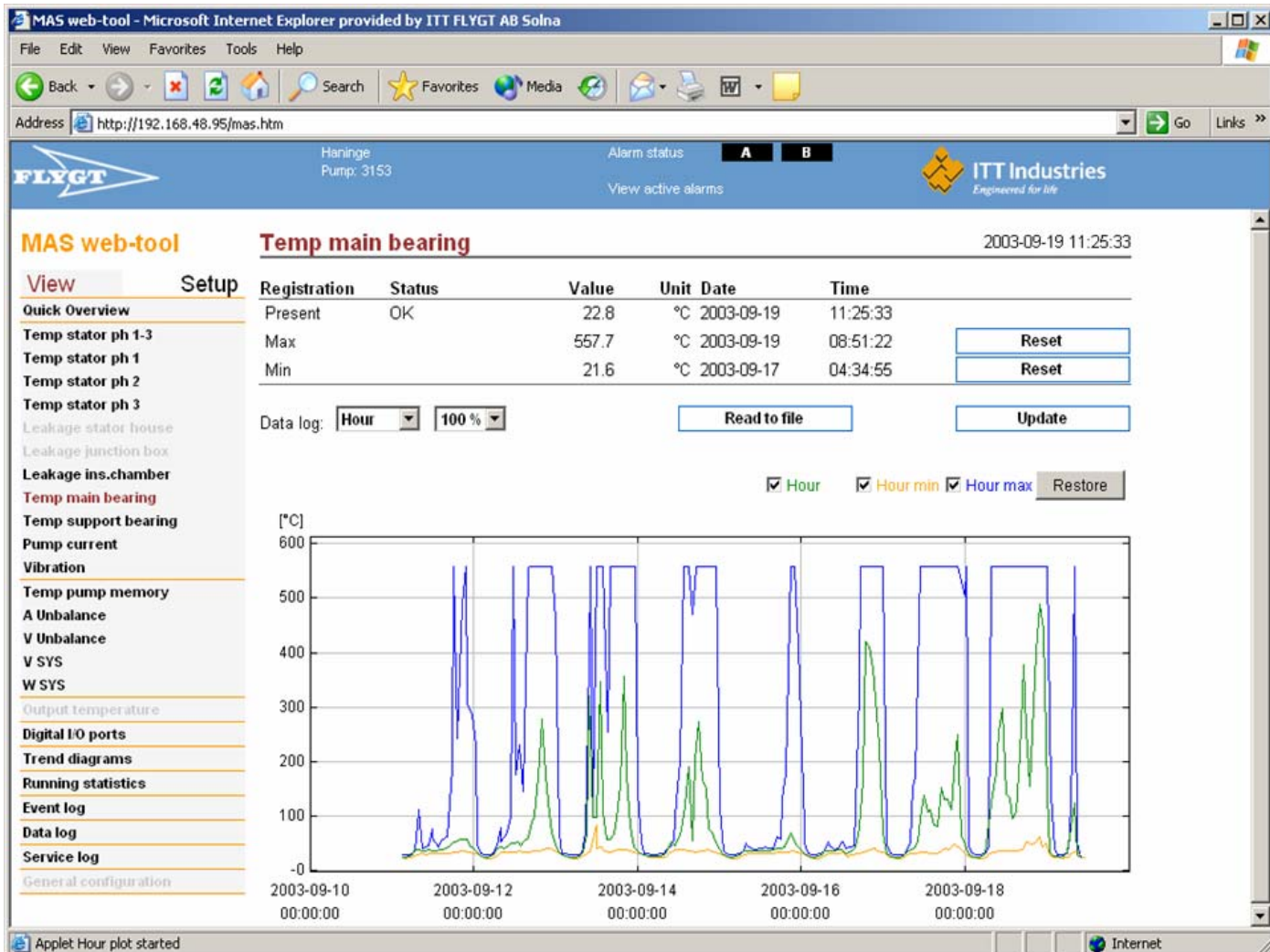
Here's the problem!



Rags, plastic and a bird?



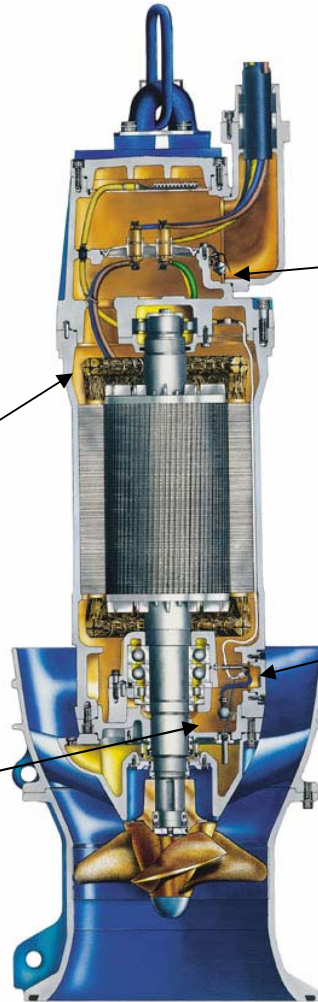






Thermal switches
stator winding

Leakage
stator housing



Leakage
connection housing

Temp measurement
main bearing

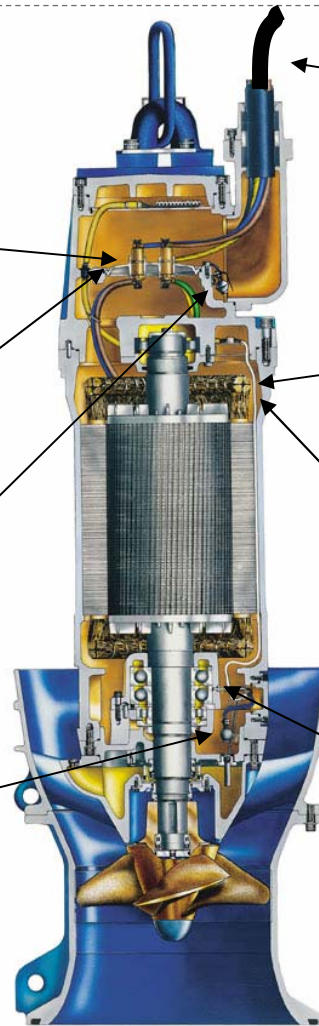
Pump memory

- Data plate info
- Acc. running time
- No of starts

Temp measurem.
pump memory

Leakage
connection housing

Leakage
stator housing



Current (1 phase)

Thermal switches
stator winding

Temp measurement
stator winding (1)

Temp measurement
main bearing

MAS G&G – All options included

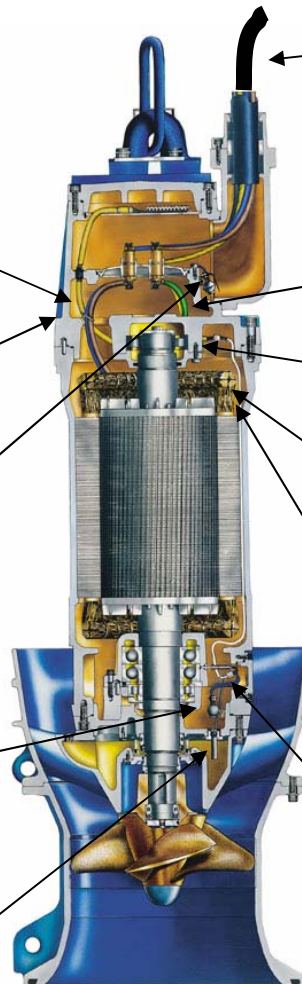
Pump memory
 - Data plate info
 - Acc. running time
 - No of starts

Temp measurem.
 pump memory

Leakage
 connection housing

Leakage
 stator housing

Leakage oil housing



Current (1 phase)

Option: Power, current (3 phases), voltage, energy

Vibration

Temp measurement
 support bearing

Thermal switches
 stator winding

Temp measurement
 stator winding (3)

Temp measurement
 main bearing

MAS options for 'Midrange'

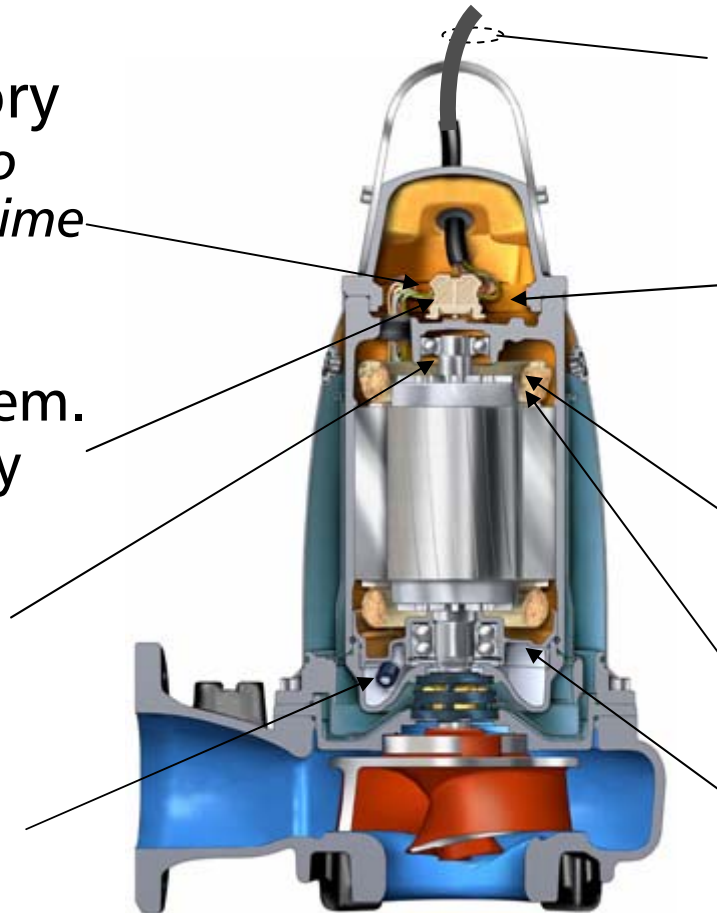
Pump memory

- Data plate info
- Acc. running time
- No of starts

Temp measurem.
pump memory

Leakage
connection
housing

Leakage
inspection
chamber



Current (1 phase)

Option: Power, current (3 phases, voltage, energy

Vibration

Temp measurement
support bearing

Thermal switches stator
winding

Temp measurement
stator winding (1) (3)

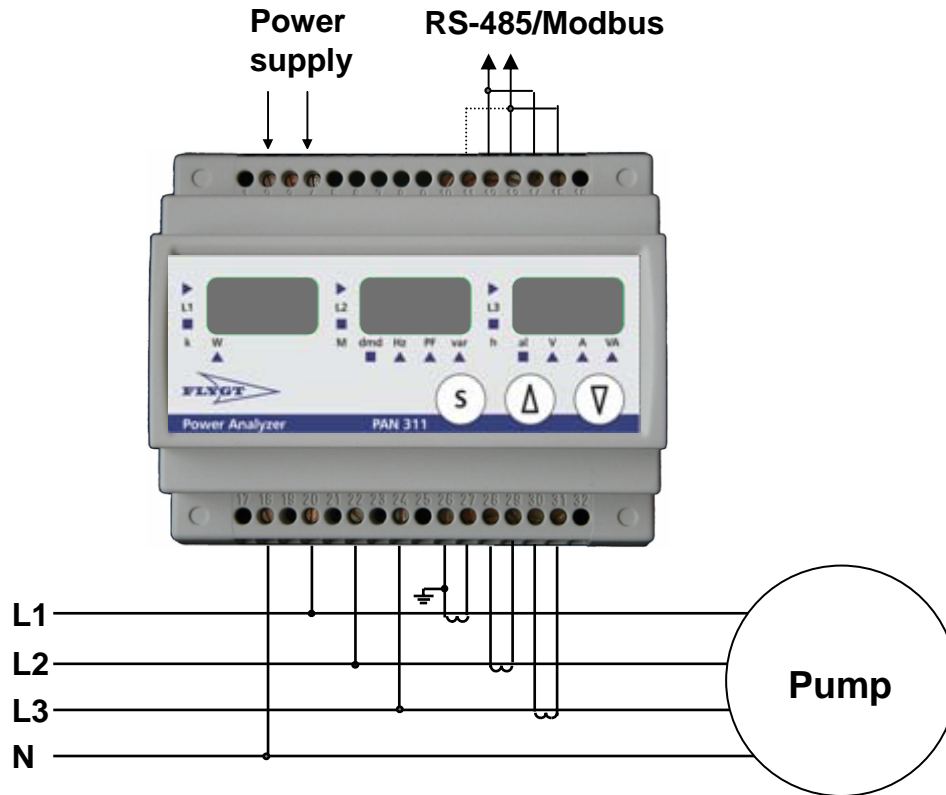
Temp measurement
main bearing

3153 not available with 24-lead SubCab

MAS 711 Pump/drive unit sensor compatibility chart

Pump Model	Drive Unit	SENSORS									
		(1) Pump Memory	(1) Junct. Chmbr FLS	(3) Stator Therm. Sw.	(1) Stator PT-100	(3) Stator PT-100	(1) Lower Brg. PT-100	(1) Upper Brg. PT-100	(1) Stator Housing FLS	(1) Leakage Chmbr FLS	(1) Vibration Sensor
N-3153	xxx	■	OPTION	■	■	N / A	OPTION	N / A	N / A	■	N / A
N-3171	xxx	■	OPTION	■	■	OPTION	OPTION	OPTION	N / A	■	OPTION
N-3202	xxx	■	OPTION	■	■	OPTION	OPTION	OPTION	N / A	■	OPTION
N-3301	xxx	■	OPTION	■	■	OPTION	OPTION	OPTION	N / A	■	OPTION
C / N / L / P	.6x5	■	■	■	■	OPTION	■	OPTION	■	N / A	OPTION
C / N / L / P	.7x5	■	■	■	■	OPTION	■	OPTION	■	N / A	OPTION
C / N / L / P	.8x5	■	■	■	■	OPTION	■	OPTION	■	N / A	OPTION
C / N / L / P	.9x5	■	■	■	■	OPTION	■	OPTION	■	N / A	OPTION
P / L	.600	Not available MAS-connected									
P / L	.680	■	■	■	■	OPTION	OPTION	N / A	■	N / A	N / A
PL-7050	.760	■	■	■	■	OPTION	■	OPTION	■	N / A	OPTION
PL-7050	.770	■	■	■	■	OPTION	■	OPTION	■	N / A	OPTION

- Chart valid only if pumps are ordered MAS-connected
- N3153-N3301 and drive unit 680 will be handled on special order
- Note: Drive unit 600 not compatible with MAS
- Power analyzer PAN311 is optional with all pump models



Data transfered to MAS:

- Power
- Energy
- Power factor
- System current
- Current in three phases
- System voltage
- Voltage in three phases
- Current unbalance
- Voltage unbalance
- RS-485/Modbus com. to MAS

...at Powell's Creek
in the US...



...in Köping, Sweden...

..and at three other places.

- Ease of use thanks to the 'Web tool'
- Alarm log plot for troubleshooting
- Inputs for all optional Flygt pump sensors
- Serial com ports to other systems
- Memory for logging (1 Mbyte)
- Integral part of a complete system with FMC and AquaView
- Pump memory with data plate, configuration data etc.
- ...

MAS costs more but eliminates the need for:

- Extra relays for Pt100 or thermistor
- Panel mounted current meter
- Running time meter
- Start counter

